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13. ABSTRACT *(Maximum 200 words)*

The objective of this effort was to develop a comprehensive and efficient model of dynamic constraint networks. The current available systems are either too complicated to understand of quite limited. The are not based on well understood theories. Their capabilities and boundaries are not formally assessed. This prevents comparison of different approaches which is essential in a process of developing and improving a model. A thoery based on static approach to constrained networks has been used to develop a dynamic theory of constraint networks for problem solving. The scientific results of this development resulted in six scientific publications.

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DYNAMIC CONSTRAINT NETWORKS

(AFOSR 88-0177)

Final Report 5/1/88 - 10/31/89

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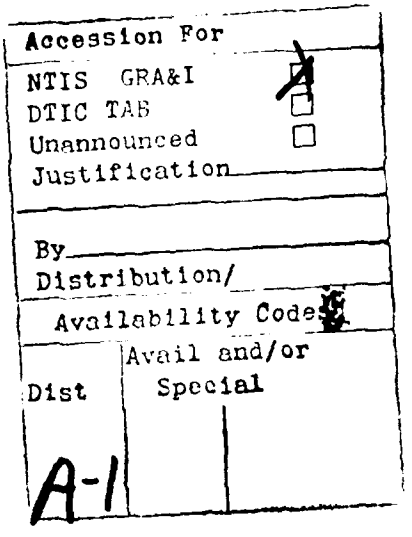

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1. STATEMENT OF WORK

Our Objective is to develop a comprehensive and efficient model of dynamic constraint-networks. The current sytems are either too complicated to understand or quite limited. They do not coherently separate the basic concepts from their implementations. In addition, since they are not based on a well understood theories, their capabilities and boundaries are not formally assessed. This prevents comparison of different approaches which is essential in a process of developing and improving a model. Our approach is based on the established theory of constraint networks hitherto used in static problem solving. This theory will form the basis for the development of a dynamic reasoning model

2. SUMMARY OF RESULTS

The following is a list of results obtained during the period of performance 5/1/88 - 10/31/89. Detailed accounts are contained in the corresponding technical reports (see References), copies of which were furnished to the Air Force.

1. Methods for changing the structure of a given constraint satisfaction problem (CSP) were introduced and demonstrated. The method works by removing redundancies, thus making the constrained-graph sparser [1].

2. The benefits of using constraint networks for representing dynamic knowledge bases was explored and its applicability to efficient diagnosis was demonstrated [2, 3].

3. An efficient scheme for decomposing a relation into a tree of binary relations was identified [4].

4. A new algorithm for clustering variables into a tree-structured CSP was conceived and its relation to another new algorithm *Adaptive consistency* (an efficient constraint recording algorithm) was established. The complexities of both algorithms were analyzed and shown to depend critically on the size of the largest clique in the triangulated constraint graph [5].

5. A formal basis was developed for analyzing the complexity and applicability of various temporal reasoning algorithm [6].

6. An economical representation was developed, called *minimal network*, which encodes all temporal relations between events, and facilitating the efficient generation of temporal scenarios, consistent with a given set of temporal constraints [6].

3. REFERENCES

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